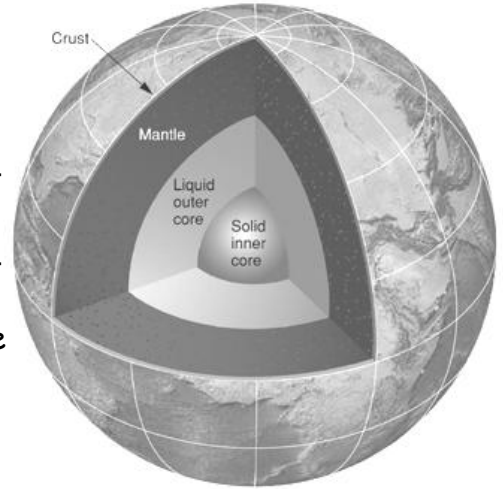


Science Notes: Changes to the Inner Earth

Part 1: The Earth's Interior

- The earth has 4 main layers, they are:
 1. _____ 3. _____
 2. _____ 4. _____
- We live on the crust, but our knowledge of the mantle & the core is based on theory. We are incapable of exploring these parts of the earth. WHY?

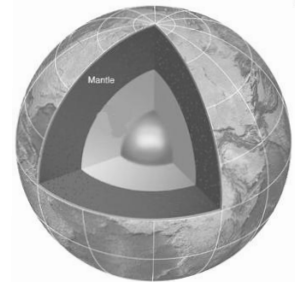


The Crust

- The crust is the _____ layer of the inner Earth.
- All life on earth exists _____
- The crust takes up _____ of the volume of the inner Earth!
- There are two major types of crust, _____ and _____.
- The crust is thicker underneath the _____ than under the _____.
- The continental crust ranges from _____.
- The oceanic crust ranges from _____.

- ❑ The temperature of the crust increases with depth. Temperatures can reach up to _____ at the boundary near the mantle.
 - ❑ The crust is broken into giant slabs of rock called tectonic plates. We'll discuss the movement of these plates later in the unit.
 - ❑ Most _____ occur in the earth's crust (otherwise in the upper mantle.)
 - ❑ Some common elements found in the earth's crust are:
-
-

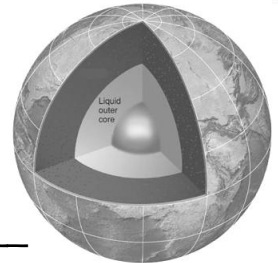
The Mantle



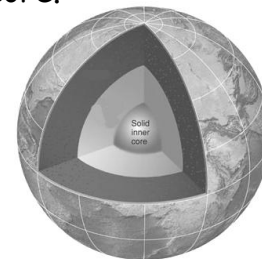
- ❑ Found beneath the crust, it is the thickest layer, making up about _____ of the Earth's volume.
 - ❑ The mantle is made mostly of _____
-
- ❑ The upper part of the mantle is rigid (solid), and together with the crust make up what is known as the _____.
 - ❑ Just below the lithosphere is a part of the mantle known as the _____.
- _____ This part of the mantle is somewhat molten (plastic), allowing the lithospheric plates on top of it to be able to move. The remaining lower mantle is extremely dense and flows VERY slowly.
- ❑ The temperature of the mantle ranges from _____ near the crust to _____ near the outer core.

- Some common elements found in the earth's mantle are:

The Outer Core

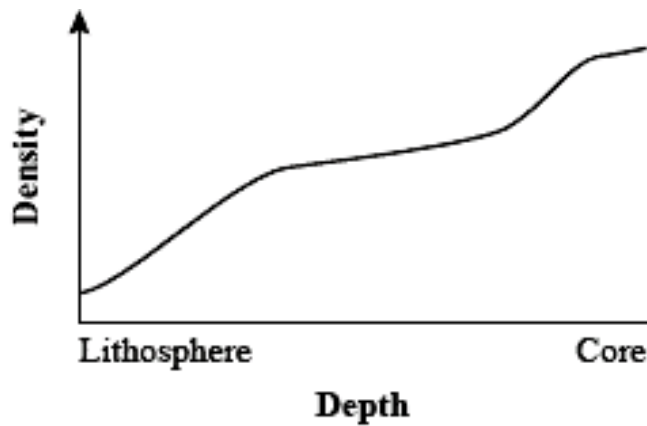


- This is the layer between the inner core and the mantle. It is made of _____
- The outer boundary begins about 2890 km (1800 miles) beneath the earth's surface. It makes up about 22% of the Earth's volume.
- The temperature of the outer core ranges from _____ near the mantle to _____ near the inner core.



The Inner Core

- This is the smallest layer of the Earth and is at the center of our planet. It is made of _____
- The inner core is the smallest, but hottest layer at _____
- It is believed to be made of _____
- Why is the inner core solid? _____
- The Inner Core has the _____ of any of the Earth's inner layers (because of the weight/pressure of the layers on top of it).
- The inner core is about _____ thick.



This graph shows the relationship between the density and depth of the Earth. Notice that as you get deeper into the earth, the density increases until the inner core (the densest) layer is reached).

How Did Scientists Determine:

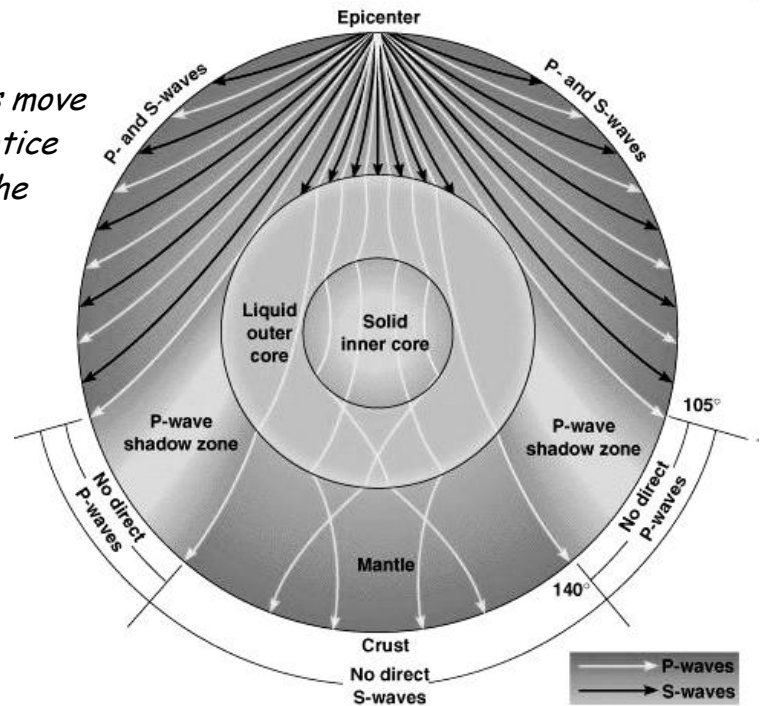
1. That there were layers in the Earth?
2. Whether these layers were solid, liquid, etc?

- ☐ These waves are detected & measured on a _____
- ☐ There are several types of seismic waves, two of the most common waves are:

1. S waves: _____

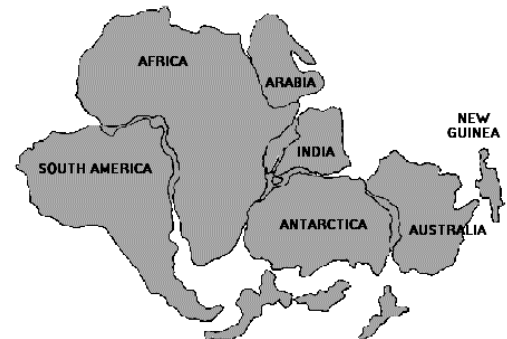
2. P waves _____

This diagram shows how P and S waves move through the interior of the Earth. Notice how the S-waves stop when they hit the liquid outer core, while the P-waves continue to travel through both cores to the opposite side of the earth.



Part 2: Continental Drift

- In the early 1900's a German scientist named _____ became interested in how earth's continents all looked like they fit together like a puzzle.



- Wegener proposed that at one time all of the continents were joined into one giant landmass called _____, meaning "_____."
- The sea surrounding this landmass was called _____.
- The theory that Wegener proposed, that involved all continents slowly spreading apart over millions of years, was called _____.

- Wegener used 3 main pieces of evidence to form his theory, what were they?

1. Evidence from _____.



2. Evidence from _____.



3. Evidence from _____.



- In 1915 Wegener published a book called *The Origins of Continents and Oceans*. This book outlined Wegener's ideas and theories.

- What did most people think of Wegener's theory (at the time)? _____

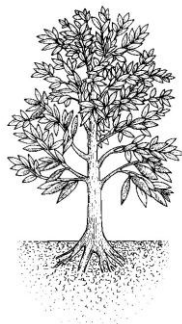
- Wegener researched his theory further and found several pieces of evidence that he thought might support it.

1. Evidence from FOSSILS

- Many years ago, fossils of the plant _____

were found in _____.

This plant was a fern-like tree that grew about 250 million years ago.



- Its seeds were _____

_____.

- Wegener hypothesized that if all of the continents were at one time connected, this would explain why fossils of this plant could be found on such separated continents.

- Fossils of the extinct animal _____ were also used as evidence.



- This animal was a reptile that _____

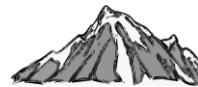
- Fossils have been found in both _____

- If these animals could survive only in _____

_____, they could

not have swum thousands of km across the salty Atlantic ocean.

2. Evidence from ROCKS



- When Wegener pieced together maps of Africa & South America he noticed that a mountain range running East-West in _____

3. Evidence from CLIMATE



- Scientists have found evidence of _____

_____ in warm areas where glaciers do not (or would not) form.

Part 3: NEWER EVIDENCE (AFTER-WEGENER)

- Further evidence was needed before people would be willing to believe a theory that involved the movement of continents. What other types of evidence were used (after his death) to help convince people that this theory was a good one?

1. Evidence from _____.

2. Evidence from _____.

3. Evidence from _____.

4. Evidence from _____.

1) Evidence from molten material



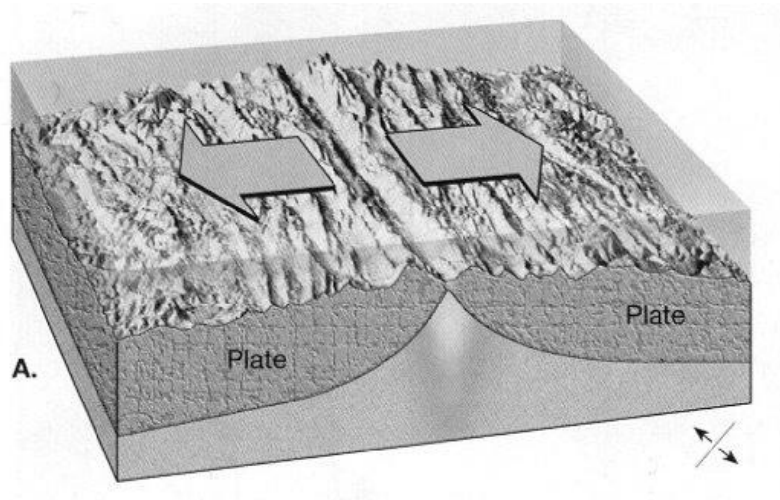
- In the 1960's, a deep sea submarine called _____ was developed. This vessel allowed scientists to research the deepest parts of the ocean.

- What did the scientists find using this vessel? _____
_____.

- This discovery proved to scientists that molten material _____
_____.

2) Evidence from ocean-floor spreading

- ❑ Scientists discovered huge underwater mountain chains called _____
_____ deep beneath the ocean's surface.
- ❑ Mid-ocean ridges have cracks that run along their center. These cracks, from which lava emerges underwater are called _____
- ❑ Lava erupts from rift valleys, cools, hardens, and pushes away older ocean floor on either side. The hardened lava forms new ocean floor. This process is called _____.



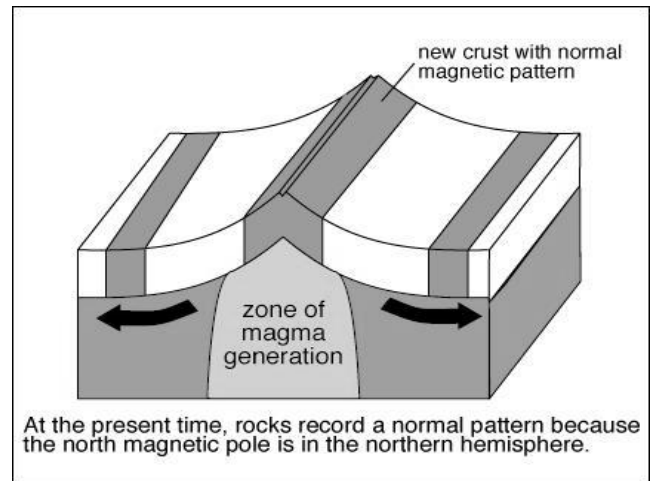
3) Evidence from drilling samples

- ❑ In 1968, a drilling ship called the _____ was built.
- ❑ What important scientific discovery did this ship make? _____

- ❑ The youngest rocks on the ocean floor are found _____ rift valleys.

4) Evidence from magnetic stripes

- ❑ Scientists have discovered that in molten rock, magnetic mineral particles line up in the direction of the earth's magnetic poles. Strangely, the earth's magnetic poles change from time to time, reversing themselves from north to south, and back again.
- ❑ When molten rock hardens, a permanent record is made of whether the earth's magnetic pole was north or south at the time of the hardening. Thus, the history of the earth's magnetism is recorded in

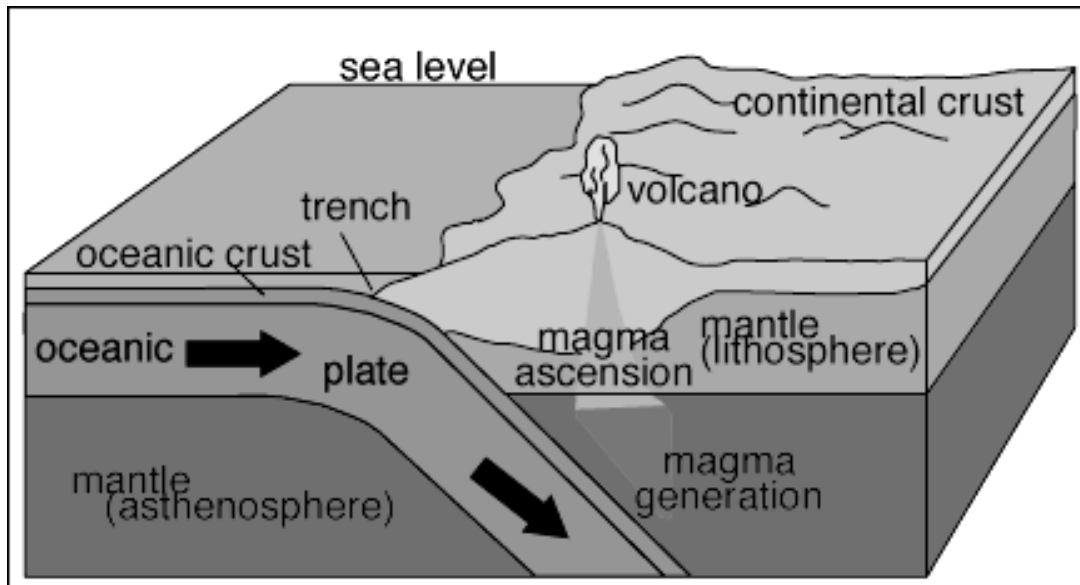


-
- ❑ Because these magnetic stripes were found in EXACTLY THE SAME PATTERNS on both sides of the mid-ocean ridges, scientists had more evidence that the ocean-floor was in fact spreading from a central point (the rift valleys).

Other Information

- ❑ Scientists have discovered another undersea feature called _____.
- ❑ Trenches are _____

- Trenches form where the process of subduction takes place. Subduction is ____



- What happens to crust that is subducted?

- Why don't the oceans continue to grow larger and larger?

Part 3: Plate Tectonics

- The theory of plate tectonics combines the ideas of _____

- The theory of plate tectonics helps to explain _____

- Most scientists believe that the lithosphere is broken up into a number of smaller pieces called tectonic plates.

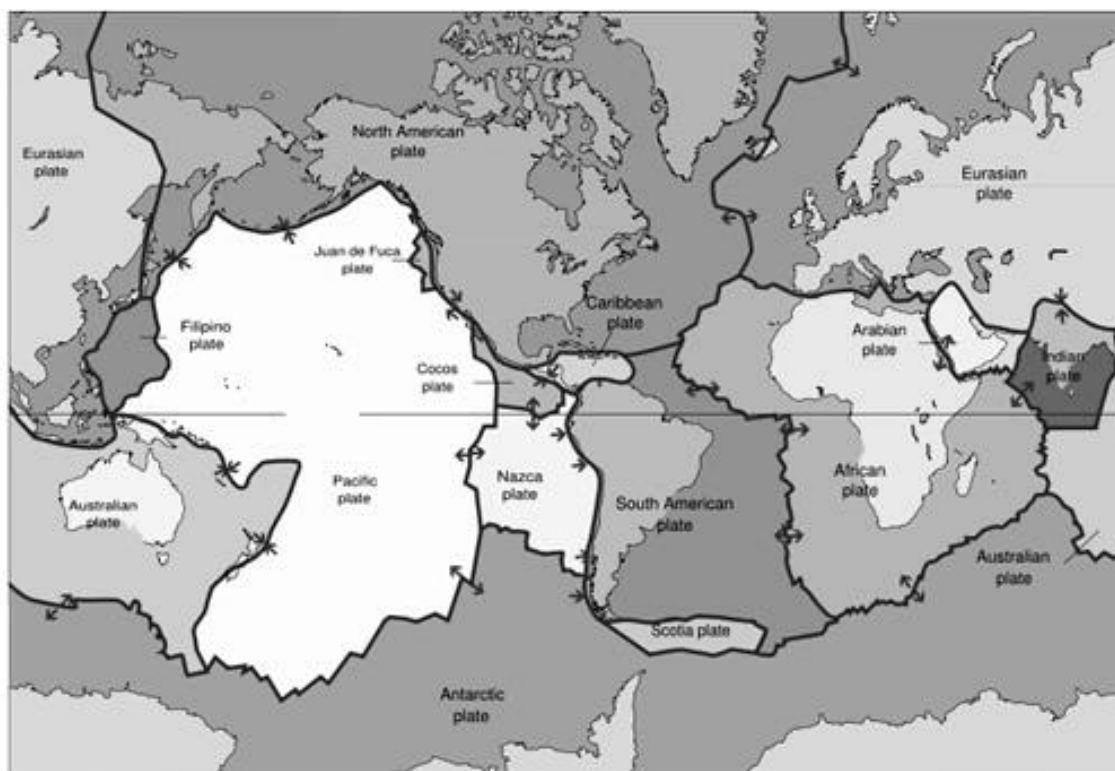
There are 7 major plates, they are:

1. _____ 2. _____

3. _____ 4. _____

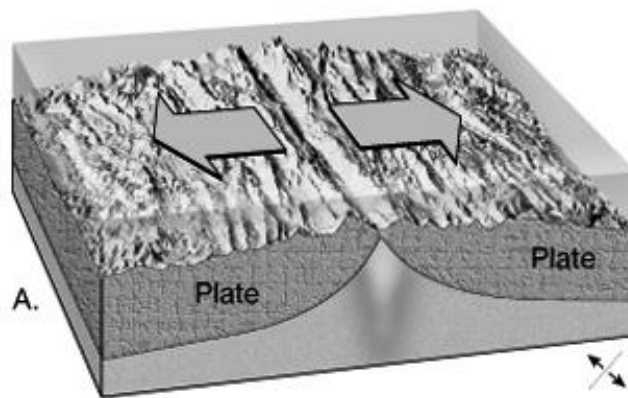
5. _____ 6. _____

7. _____

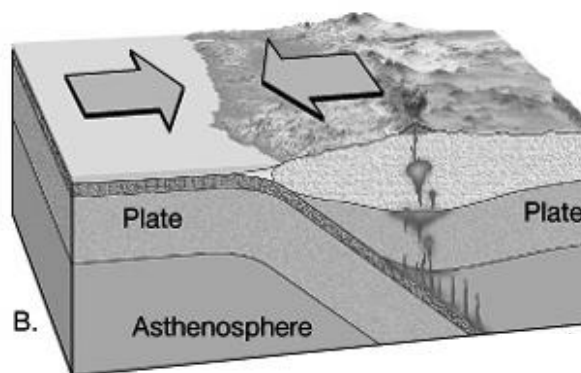


- Each plate has an edge where it meets another plate. These areas are called **BOUNDARIES**. There are 3 basic types of plate boundaries:

1. Constructive (Divergent) Boundaries: _____

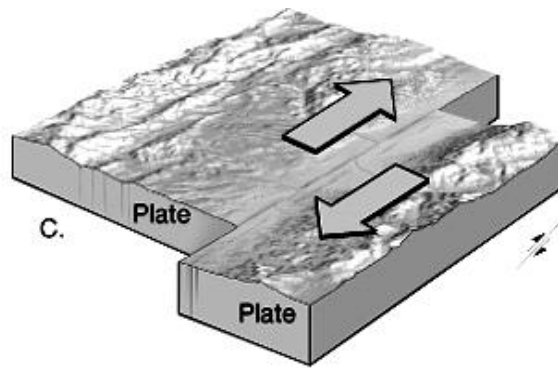


2. Destructive (Convergent) Boundaries: _____



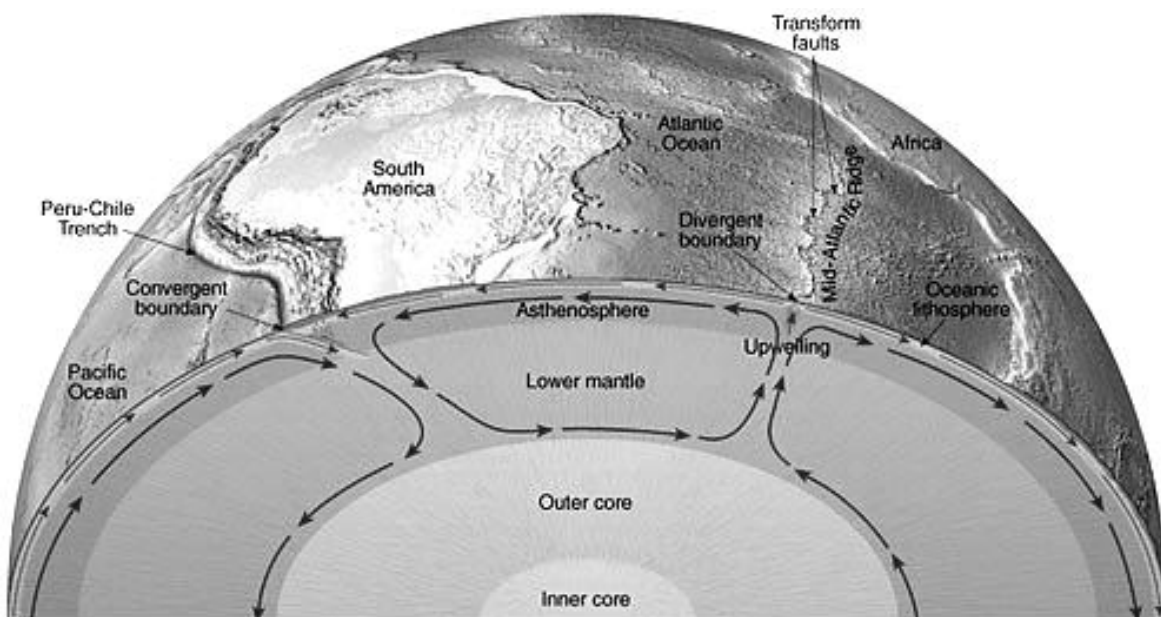
- The edges of the Pacific Ocean contain many destructive boundaries. Because of this, there are many volcanoes along the edges of this ocean. We call this area around the Pacific Ocean the _____

3. Transform Boundaries: _____



➤ Scientists think that **CONVECTION CURRENTS** that occur within the upper mantle are what causes lithospheric plates to move.

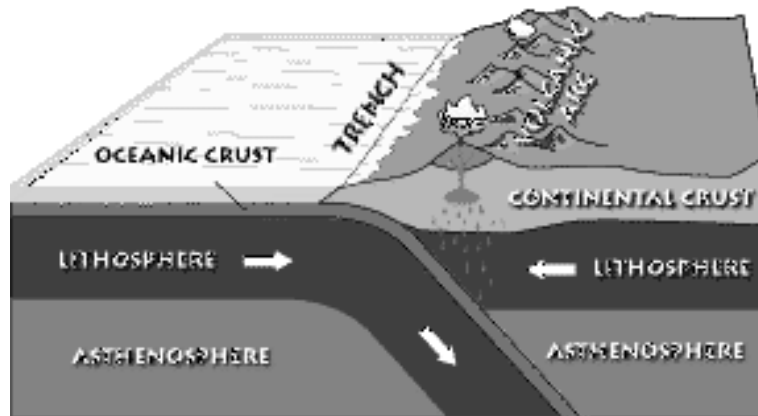
➤ A convection current in the mantle is _____



- The earth contains two basic types of crust. **Oceanic Crust** and **Continental Crust**. Continental Crust is less dense than Oceanic Crust and is made primarily of **granite**. Oceanic Crust is more dense than Continental Crust and is made mostly of **basalt**. Let's examine what happens when plates that contain these two types of crust collide.

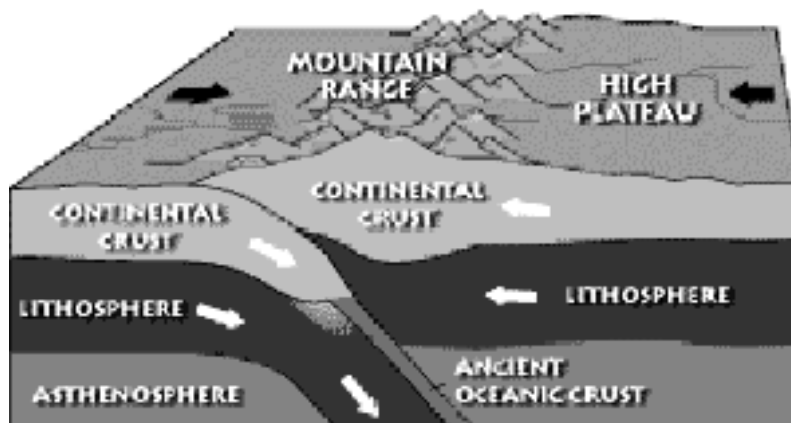
1. When continental crust meets oceanic crust: _____

- A volcano may form on the plate that _____



2. When continental crust meets another piece of continental crust: _____

- Lots of _____ happen in these areas.



3. When oceanic crust meets oceanic crust: _____

➤ A string of volcanoes erupts on the ocean floor. This eventually may form _____

